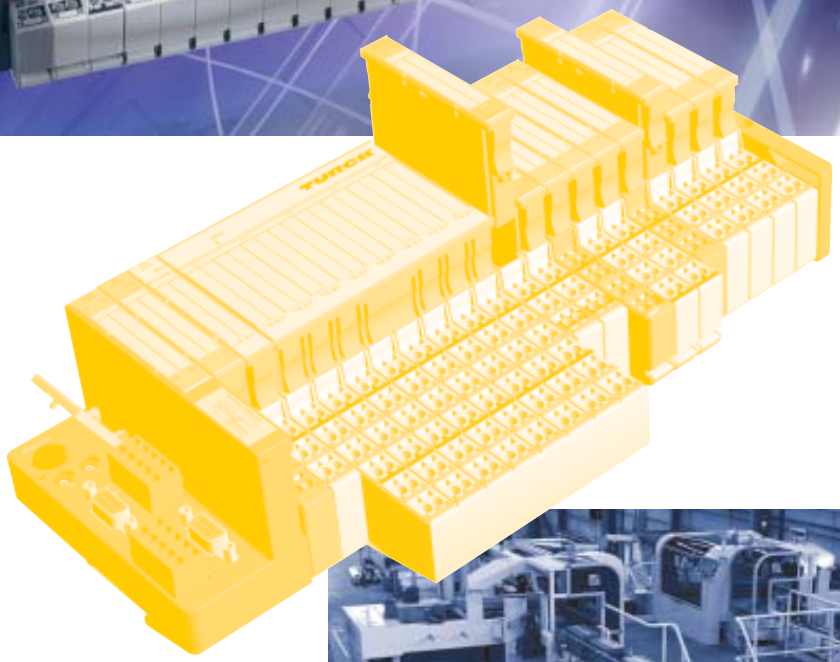
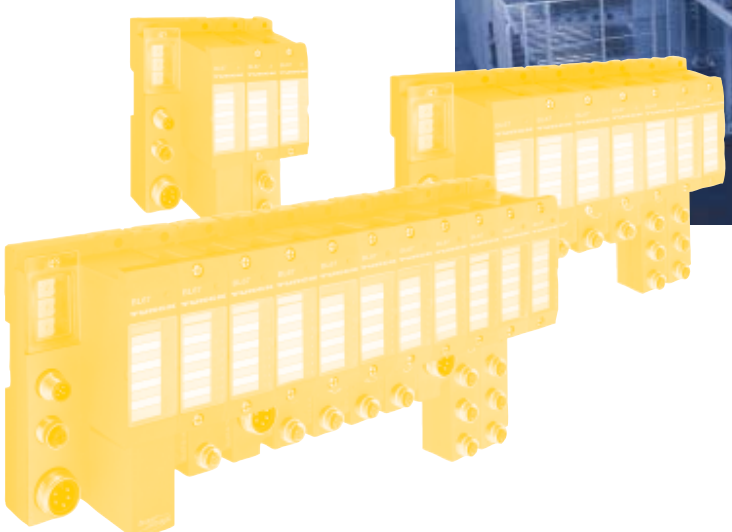
TURCK

Industrial
Automation

BL20/BL67-

USER MANUAL FOR PROFIBUS-DPV1





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Safety Notes!

Before starting the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighboring units that are live.
- Follow the engineering instructions of the device concerned.
- Only suitably qualified personnel in accordance with EN 50 110-1/-2 (VDE 0 105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalization. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference do not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60 364-4-41 (VDE 0 100 Part 410) or HD 384.4.41 S2.
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60 204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).
- The electrical installation must be carried out in accordance with the relevant regulations (e. g. with regard to cable cross sections, fuses, PE).
- All work relating to transport, installation, commissioning and maintenance must only be carried out by qualified personnel. (IEC 60 364 and HD 384 and national work safety regulations).
- All shrouds and doors must be kept closed during operation.

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Documentation Concept

This manual contains all information about the BL67/BL20-gateways for PROFIBUS-DPV1.

It is a supplementary manual to the existing PROFIBUS-DP manuals for the TURCK I/O systems BL20 (TURCK documentation number: German: D300822/ English: D300458) and BL67 (TURCK documentation number: German: D300570/ English D300527).

The following chapters contain a short description of the field bus system PROFIBUS-DPV1, a system-independent description of the DPV1 gateways for BL67 and BL20 as well as an application example for the connection of the TURCK-DPV1 gateways to a Siemens PLC S7

Note

For all system product properties, which are not specific for the DPV1-gateways, as for example connection possibilities, technical data or similar, please read the PROFIBUS-DP manuals for the BL20 and BL67 mentioned above.

The bus-independent I/O-modules for BL67 as well as all further fieldbus-independent chapters like mounting, labelling etc. are described in a separate manual.

- BL20 I/O modules
  (TURCK documentation number: German D300716/ English D300717)
- BL67 I/O modules
  (TURCK documentation number: German D300572/ English D300529)

General Information

Attention

Please read this section carefully. Safety aspects cannot be left to chance when dealing with electrical equipment.

This manual contains all necessary information for the prescribed use of the BL20/BL67 gateways for PROFIBUS-DPV1. It has been specially conceived for qualified personal with specialized knowledge.

Prescribed Use

Warning

The devices described in this manual must be used only in applications prescribed in this manual or in the respective technical descriptions, and only with certified components and devices from third party manufacturers.

Appropriate transport, storage, deployment and mounting as well as careful operating and thorough maintenance guarantee the trouble-free and safe operation of these devices.

Notes Concerning Planning /Installation of this Product

Warning

All respective safety measures and accident protection guidelines must be considered carefully and without exception.

Description of Symbols Used

Warning

This sign can be found next to all notes that indicate a source of hazards. This can refer to danger to personnel or damage to the system (hardware and software) and to the facility.

This sign means for the operator: work with extreme caution.

Attention

This sign can be found next to all notes that indicate a potential hazard.

This can refer to possible danger to personnel and damages to the system (hardware and software) and to the facility.

Note

This sign can be found next to all general notes that supply important information about one or more operating steps. These specific notes are intended to make operation easier and avoid unnecessary work due to incorrect operation.

List of revisions

In comparison to the previous manual edition, the following changes/ revisions have been made:

Table 1: List of revisions

Chapter	Subject/ description	new	change
Chap. 2tp	Channel-specific diagnosis messages of the modules, page 2-22		X
	Meaning of the DPV1-error codes for the BL××-I/O-modules, page 2-23	X	

Note

The publication of this manual renders all previous editions invalid.

1 PROFIBUS-DPV1

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General

PROFIBUS-DPV1 is an enhancement of PROFIBUS-DP which provides the possibility of acyclic data communication.

A cyclic and centrally directed data transfer between master and slaves is characteristic for the standard functions of PROFIBUS-DP. A Class1 mater (PLC) controls the cyclic exchange of process data with the slaves. The data exchange is carried out in rotation and in a defined order. The data which have to be transmitted are projected beforehand.

Via acyclic communication functions, PROFIBUS-DPV1 now offers the possibility to transmit data to the slave in addition to the cyclic process data.

Acyclic data transfer

The need for acylcic data transfer exists wherever slave devices which provide several parameterization options have to be parameterized during operation.

Typical examples are the parameters of a drive, like limit values, rotational speed or torque, operation mode and the generation of an error list.

Acyclic services are handled with low priority, paralelly and additionally to the cylcic process data transfer. The negative influence on the speed of the high-priority process data transfer, shall thus be minimized.

DPV1-functions

The DPV1-functions consist basically of the services "Read" and "Write". The master uses these services for read- or write access to data blocks in PROFIBUS.

In addition to that, an "intiate" and "abord"-service for the connection management, a "data-transport"-service for the exchange of large data packages and the "alarm"-and "status"-services for the transmission of alarm messages have been defined.

Note

At present, the BLxx-gateways for DPV1 only support the services "Read" and "Write".

DPM1 versus DPM2

PROFIBUS-DPV1 differentiates between two master classes.

An automation system (PLC), which generally controls the basic cyclic process data transfer with standard DP-functions, is defined as Class1-master. A Class1-master can use DPV1-functions optionally.

The new Class2-master is generally an engineering tool which is used for the acyclic data transfer.

The protocol cycle of the DPV1-functions on the field bus depends on the use of a Class1- or a Class2-master.

Addressing the data in DPV1

The data-addressing is done per module by means of the following details:

- slot
- index
- length

The slot-number addresses the module and the index addresses the module's parameters. Each data block can have a maximum size of 240 bytes.

In case of a successful data access, the slave sends a positive answer. If the data access failed, a negative answer which classifies the problem precisely is sent.

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Introduction

This chapter contains a description of the characteristics of the BL××-gateways for PROFIBUS-DPV1.

As the DPV1-gateways for BL20 and BL67 do not differ from the DPV0-gateways in their technical data, their connection options (field bus, power supply), their mechanical mounting etc., only the special features of the DPV1-gateways are described in the following.

For topics which are DPV0/DPV1-common you will therefore find cross references to the respective documentation for the DPV0-gateways:

- BL20:
  German: D300822/ English: D300458
- BL67:
  German: D300570/ English: D300527

Function

The BL××-DPV1-gateways allow the operation of BL××-modules on PROFIBUS-DPV1. The gateway is the connection between the I/O-modules and the PROFIBUS-masters (see Chapter 1, PROFIBUS-DPV1).

The gateways regulate the process data between the I/O level and the fieldbus, and generate diagnostic data for the higher-level master.

Information is made available to the software tool I/O-ASSISTANT via the service interface.

Note

BL×× gateways can only be used as slaves.

Important notes concerning the DPV1-gateways

Compatibility

Attention

BLxx-DPV0-gateways can not be replaced by the new DPV1-gateways. The devices have different indent numbers and different GSD-files.

Diagnosis

Note

The new DPV1-gateways allow the DP-standard-diagnosis according to PROFIBUS-DP specification.
The diagnosis is not compatible with the diagnosis of the DPV0-gateways.

Technical data

Note

This section corresponds to the respective chapter in the manuals for the DPV0-gateways (BL20: German D300822/ English D300458; BL67: German D300570/ English D300527).

The BL××-gateways for DPV1 show the following special properties:

Table 1: Properties of the DPV1-gateways

Maximum number of modules in a station	
BL67	32
BL20	48
Parameters	max. 244 bytes (3 bytes DPV1 + 2 bytes gateway + 239 module parameters)
Configuration	max. 244 bytes
Diagnosis	max. 244 bytes (6 bytes standard-diagnosis + 239 bytes user-diagnosis)
Input data	max. 244 bytes
Output data	max. 244 bytes
Master Class2 interface	1 channel
supported acyclic services	READ WRITE
I&M (identification & maintaining)	I&M0, acc. PROFIBUS-DP-specification

Connection options

Note

This section corresponds to the respective chapter in the manuals for the DPV0-gateways (BL20: German D300822/ English D300458; BL67: German D300570/ English D300527).

Addressing

Note

This section corresponds to the respective chapter in the manuals for the DPV0-gateways (BL20: German D300822/ English D300458; BL67: German D300570/ English D300527).

Module description in the Electronic Device Data Sheets (GSD)

The BL××-gateways are integrated into PROFIBUS structures using electronic device data sheets (GSD).

Note

The GSD-files for the BL××-DPV1-gateways do not allow the module representation according to type. Only the standard module representation is possible. For further information, please read the manuals for the DPV0-gateways (BL20: German D300822/ English D300458; BL67: German D300570/ English D300527).

The modules are identified in the BL××-DPV1-gateways by means of their indent-number.

Industrial Automation

Parameterization

Gateway parameters

The BLxx-gateways for PROFIBUS-DPV1 use 5 bytes of parameter data which exclusively describe the behavior of the gateway.

Description of the gateway parameters

The texts in the columns "parameter name" and "value" correspond to those defined in the electronic device data sheets (GSD-files).

Table 2: Gateway parameters

A default-settings

Byte/ parameter name	**Value**		**Meaning**
general parameters			
Byte 0: reserved			
Byte 1:			
– Bit 0: startup when expected/actual config. differ			
	0	activated **A**	Reaction depending on the parameter Bit 6: Static configuration, byte 4, bit 6 →If the static configuration is deactivated, the process data exchange is not disturbed in case of module sequence error.
	1	deactivated	Reaction depending on the parameter Bit 6: Static configuration, byte 4, bit 6 →If the static configuration is activated, the process data exchange is not disturbed in case of module sequence error.
– Bit 1 to 7: reserved			
Byte 2:			
– Bit 0 to 5: reserved			
– Bit 6: reserved (depending on the configuration tool)			
– Bit 7: DP-Alarm-Mode			
	0	DPV0	-
	1	DPV1 **A**	DPV1-specific parameters are activated.

Table 2: Gateway parameters

A default-settings

Byte/ parameter name	Value		Meaning
device specific parameters			
Byte 3:			
– Bit 0 and 1: Outputs module sequence deviation			
	00	Output 0 **A**	The gateway switches the outputs of the modules to "0". No error information is transmitted.
	01	Output substitute value	The gateway switches the outputs of all modules (with the exception of analog output modules) to "0". Error information is transmitted to the analog output modules. Depending on their configuration, these modules decide to set their outputs either to "0" or to a default value, or to maintain the original values. The non-configured analog output modules set their outputs to "0".
	10	Hold current value	The gateway maintains the actual output settings of all modules, (with the exception of analog output modules). Error information is transmitted to the analog output modules. Depending on their configuration, these modules decide to set their outputs either to "0" or to a default value, or to maintain the original values. The non-configured analog output modules maintain their current output settings.
	11	Exchange process data	The gateway carries on exchanging process data with the other module bus stations. No error information is transmitted.
– Bit 2 and 3: Outputs module sequence error			
	00	Output 0 **A**	The gateway switches the outputs of the modules to "0". No error information is transmitted.
	01	Output substitute value	The gateway switches the outputs of all modules (with the exception of analog output modules) to "0". Error information is transmitted to the analog output modules. Depending on their configuration, these modules decide to set their outputs either to "0" or to a default value, or to maintain the original values. The non-configured analog output modules set their outputs to "0".

Table 2: Gateway parameters

A default-settings

Byte/ parameter name	Value		Meaning
	10	Hold current value	The gateway maintains the actual output settings of all modules, (with the exception of analog output modules). Error information is transmitted to the analog output modules. Depending on their configuration, these modules decide to set their outputs either to "0" or to a default value, or to maintain the original values. The non-configured analog output modules maintain their current output settings.
	11	Exchange process data	The gateway carries on exchanging process data with the other module bus stations. No error information is transmitted.
– Bit 4 and 5: Outputs fieldbus error			
	00	output 0 **A**	The gateway switches the outputs of the modules to "0". No error information is transmitted.
	01	output substitute value	The gateway switches the outputs of all modules (with the exception of analog output modules) to "0". Error information is transmitted to the analog output modules. Depending on their configuration, these modules set their outputs either to "0" or to a default value, or maintain the original values. The non-configured analog output modules set their outputs to "0".
	11	Hold current value	The gateway maintains the actual output settings of all modules (with the exception of analog output modules). Error information is transmitted to the analog output modules. Depending on their configuration, these modules set their outputs either to "0" or to a default value, or maintain the original values. The non-configured analog output modules maintain their current output settings.
Byte 4:			
– Bit 0: Integer data format			
	0	LSB first	Data is converted to INTEL format (standard format).
	1	MSB first	16-bit data are transmitted with the high and low bytes reversed (MOTOROLA format). This parameter influences the process data!
– Bit 1: Diagnostics from modules			
	0	activate **A**	Diagnostic messages from the module bus stations are made known to the fieldbus master as extended diagnostics.
	1	deactivate	Diagnostic messages from the module bus stations will not be displayed. A station diagnostic is not automatically generated along with module diagnostics.

Table 2: Gateway parameters

A default-settings

Byte/ parameter name	Value		Meaning
– Bit 2: V_O diagnostics			
	0	activate **A**	The monitoring function for the field supply V_O (from gateway and power feeding modules) is activated. If this parameter is set but the parameter "Diagnostics from modules" (see bit 1) deactivated, then only the voltage supply at the gateway is monitored. A monitoring of the voltage supply at the power feeding module is not realized.
	1	deactivate	
– Bit 3: reserved			
– Bit 4: I/O-ASSISTANT ForceMode			
	0	release **A**	I/O-ASSISTANT can set the force mode.
	1	block	I/O-ASSISTANT cannot set the force mode, if the station was parameterized by the DP master.
– Bit 6: Static configuration			
	0	activate **A**	Changes in the station configuration are stored in the gateway following a power-on reset. In case of a module sequence error, a process data exchange is still possible.
	1	deactivate	If the static configuration is deactivated, a dynamic configuration take-over is realized directly following station configuration changes (important for acyclic parameterization). The station stops the process data exchange and the bus communication as soon as a module sequence error appears, ignoring the parameterization for error handling. But, the communication is not interrupted, if the gateway-parameter byte 1, bit 0 "startup when expected/actual config. differ" (see page 2-9) is activated.
– Bit 7: reserved			

Module parameters

When using the BL××-**DPV0**-gateways, whether the standard module representation or the module representation according to type can be chosen for the I/O-modules. This setting influences the number of parameter bytes for the single modules.

The **DPV1-gateway** does **not** support these different types of module representation.

Note

The number of parameter bytes for the modules in DPV1 always corresponds to the number of parameter bytes in the module representation according to type.

Example:

1 parameters: BL67-4DI-PD with **DPV1**-gateway

Table 3: Parameters with DPV1-gateway for BL67-4DI-PD

A default-setting
B n = 0

Byte	Bit	Parameter	Value/ Meaning
n **B**	0	input filter 1	0 = deactivate **A** 1 = activate
	...		
	3	input filter 4	
n + 1	0	digital input 1	0 = normal **A** 1 = inverted
	...		
	3	digital input 3	
n + 2	0	Operation mode group A	0 = normal **A** 1 = open circuit monitoring
	1	Operation mode group B	

2 parameters: BL67-4DI-PD with DPV0-gateway

Table 4: Parameters with DPV0-gateway BL67-4DI-PD

A default-setting
B **n = 0** → module representation acc. to type **n = 1** → standard module representation

Byte	Bit	Parameter	Value/Meaning
n **B**	0	input filter 1	0 = deactivate **A** 1 = activate
	...		
	3	input filter 4	
n + 1	0	digital input 1	0 = normal **A** 1 = inverted
	...		
	3	digital input 3	
n + 2	0	Operation mode group A	0 = normal **A** 1 = open circuit monitoring
	1	Operation mode group B	

Parameter "module parameterization"

Each parameterizable module within the BL20/BL67-product range, gets the additional parameter "module parameterization" via the GSD-file of the respective DPV1-gateway.

Note

This parameter is not part of the module parameters, but is only important for the communication between gateway and the modules.

- **"module parameterization" activated**
  The module receives its parameter settings from the DPV0-master with every change of the station to "Data_Exchange".
  Changes in the parameter settings, which were done in the meantime for example by a Class2-master, a configuration tool or similar, are overwritten by the valid parameter telegram of the master.
- **"module parameterization" deactivated**
  Changes in the parameter settings, which were done for example by a Class2-master, a configuration tool or similar, are stored in the module.
  Parameter telegrams from a DPV0-master are ignored for the respective module. The module is now blocked and a DPV0-parameter access is no longer possible.

Attention

If the parameter "module parameterization" is deactivated, the module parameterization is only possible via acyclic services or configuration tools (e.g. I/O-ASSISTANT)!

If a module is replaced by a new one, the gateway has to be operated with active U_{sys}, in order to keep the module's parameter-settings for the new module.
U_L has to be switched-off and the station has to be separated from the field bus.
Now, the gateway sends the parameters defined for the old module, into the new module.

Status indicators/ diagnostic messages gateway

The gateway transmits the following diagnostics:

- undervoltage detection for system and field supply,
- the status of the BL67 station,
- the communication via the internal module bus,
- the communication to PROFIBUS-DP
- the status of the gateway.

Diagnostic messages are displayed in two ways:

- via individual LEDs
- via the software of the respective fieldbus master (for example, PLC)

Diagnostic messages via LEDs

Note

This section corresponds to the respective chapter in the manuals for the DPV0-gateways (BL20: German D300822/ English D300458; BL67: German D300570/ English D300527).

Diagnostic messages via the software

The diagnostic messages are displayed in the corresponding software of the PROFIBUS-DP master as diagnostic bytes.

For the meaning of the individual diagnostic bits for the BL××-DPV1-gateways, please refer to the following section.

The diagnosis telegram

The diagnosis telegram of the BLxx-DPV1-gateways is structured as follows:

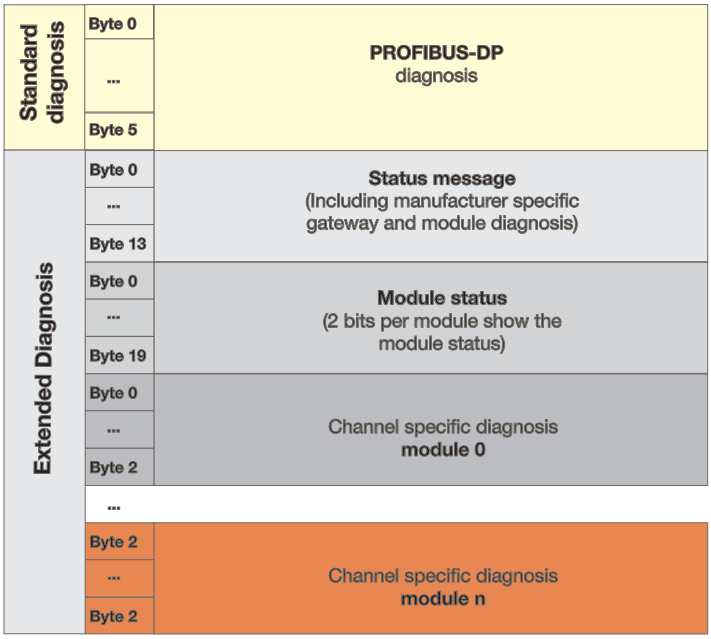

Figure 1: The diagnosis telegram of the BLxx-DPV1-gateways

Status message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4/5	Byte 6 to 13
block header byte	status type	slot-no.	specifier	gateway-diag-nosis	Common-module-diagnosis

Table 5: Status message

Byte 0	**Block header byte:** This header byte defines status- and alarm-PDUs (bit 6 and bit 7 = "00"). In addition to that, it contains information about the length of the diagnosis telegram (length = 14 bytes). The header byte included.
Byte 1	**Status type**: bit 7 = 1 (defines, that the message is a status-PDU). bit 0 to 6: define the type of the status-PDU: bit 0 = 1 →*status message*
Byte 2	**Slot number**: Always "0", because the gateway is the first module of the station.
Byte 3	**Specifier**: "0" = no further differentiation
Byte 4 and Byte 5	**Gateway diagnosis** (see also section Description of the gateway diagnosis bytes, page 2-20) Byte 4, bit 0 shows, if a module within the station sends a diagnosis (bit 0 = 1) or not (bit 0 = 0).
Byte 6 to 13	Common module diagnosis (1 bit per module) Shows, which module sends a diagnosis, if a wrong module is plugged or if a module is missing).

Note

In the 8 byte-common module diagnosis (bytes 6 to 13), 1 bit is reserved for every module. A status message can thus display diagnosis messages of at most 64 modules.
These 8 bytes are always sent. So, it is not relevant, if the modules within the station send diagnosis messages or not. Additionally, the status message is independent of the actual number of modules in the station.
Pending diagnosis messages are indicated by "1". "0" indicates no active diagnosis message.

Module status

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4 to 19
block header byte	status type	slot-no.	specifier	module diagnosis (2 bits per module)

Table 6: Module status

Byte 0	**Block header byte:** This header byte defines status- and alarm-PDUs (bit 6 and bit 7 = "00"). In addition to that, it contains information about the length of the diagnosis telegram (length = 20 bytes). The header byte is included.
Byte 1	**Status type**: bit 7 = 1 (defines, that the message is a status-PDU). bit 0 to 6: define the type of the status-PDU: bit 1 = 1 →*module status*
Byte 2	**Slot number**: Always "0", because the gateway is the first module of the station.
Byte 3	**Specifier**: "0" = no further differentiation
Byte 4 to 19	**Module status** (2 bits per module): **00** = data valid, ok. **01** = module sends a diagnosis; data not valid, for example "short-circuit". **10** = wrong module at slot (the plugged module does not correspond to the module planned in the reference module list of the gateway); data not valid **11** = module missing (no module is plugged, although it is planned in the reference module list of the gateway); data not valid.

Note

In the 16 byte-module status (bytes 4 to 19), 2 bits are reserved for every module. A module status can thus display diagnosis messages of at most 64 modules.
These 16 bytes are always sent. So, it is not relevant, if the modules within the station send diagnosis messages or not. Additionally, the module status is independent of the actual number of modules in the station.
Please refer to Table 6: Module status for the meaning of the diagnosis message. "0" indicates no active diagnosis message.

Channel-specific diagnosis

The channel-specific diagnosis consists of 3 bytes **per module**:

1 byte Header
+ 1 byte channel description
+ 1 byte error-codes

Table 7: channel specific diagnosis

Byte 1	**Header** Defines the channel specific diagnosis via bit 6 and bit 7 = "10". In addition to that, it contains the number of the module which sends the diagnosis message (bit to bit 5).
Byte 2	**Module**: Bit 0 to bit 5 contain the channel number. Bit 6 and bit 7 define, if the channel is an input or an output channel: **01** = input **10** = output **11** = in- and output
Byte 3	**Diagnosis message**: Bit 5 to bit 7 define, if the module is a bit-, byte- or word-oriented module: **001** = bit-oriented **010** = 2 bit-oriented **011** = 4 bit-oriented **110** = word-oriented **111** = double word-oriented Bit 0 to bit 4 contain an error code (decimal), which specifies the diagnosis message (see section Channel-specific diagnosis messages of the modules, page 2-22)

Note

The channel-specific diagnosis is generated for every channel of a module within a station, which is actually present and which sends active diagnosis.

Description of the gateway diagnosis bytes

Table 8: Gateway diagnosis byte

Diagnosis byte	Bit	Description
Byte 1	**Gateway warnings**	
	Module diagnostics available	
	0	**0** = No module bus station is signaling a diagnostic. **1** = At least one module bus station with diagnostic function is signaling a diagnostic.
	1	reserved
	2	reserved
Byte 1	3	Station configuration changed
		0 = The actual list of modules matches the configuration set in the configuration software of the corresponding fieldbus master. **1** = The actual list of modules has been altered in such a manner, that process data can still be exchanged with the module bus stations which are at present connected to the module bus. The constellation of the module bus station that is set in the configuration software (CheckConfig-Cmd) of the corresponding fieldbus master serves as a reference.
	4	undervoltage field supply V_O
		0 = field supply V_O is within the permissible range **1** = field supply V_O is not within the permissible range
	5	reserved -
Byte 1	6	undervoltage field supply V_I
		0 = field supply V_I is within the permissible range **1** = field supply V_I is not within the permissible range
	7	Overcurrent/ Short circuit I_I
		0 = current I_I is within the permissible range **1** = current I_I is not within the permissible range

Table 8: Gateway diagnosis byte

Diagnosis byte	Bit	Description
Byte 2	Gateway errors	
	0...1	reserved -
	2	Module bus error
		0 = Communication with the module bus station on the module bus is possible. **1** = Communication with the module bus station on the module bus is not possible.
	3	Master configuration error
		0 = The actual list of modules matches the configuration set in the configuration software of the corresponding fieldbus master. **1** = The actual list of modules has been altered in such a manner, that no process data can be exchanged with the module bus stations which are at present connected to the module bus. The constellation of the module bus station, set in the configuration software of the corresponding fieldbus master serves as a reference.
	4	reserved
	5	Station configuration error
		0 = The gateway has prepared the station's configuration to be read out. **1** = The gateway could not prepare the station's configuration to be read out.
Byte 2	6	I/O-ASSISTANT Force Mode active
		0 = The fieldbus master can access the parameter, diagnostics and process data of the module bus stations. **1** = The force mode has been activated via the service interface (by I/O-ASSISTANT). This separates the fieldbus master from the outputs of the module bus stations. No process data exchange is taking place from the fieldbus master to the output modules.
	7	reserved

Channel-specific diagnosis messages of the modules

DPV1 - error codes

On PROFIBUS-DP, the channel-specific diagnosis messages are display as DPV1-error codes and defined as follows.

The corresponding module diagnostics are shown in Table 10: Error codes / module diagnostics.

Table 9: Channel-specific diagnosis

Value (dec.)	Diagnostic message
Error-Codes (1 to 9 according to DP-spec.)	
1	short-circuit
2	undervoltage
3	overvoltage
4	overload
5	overtemperature
6	wire-break
7	upper limit value exceeded
8	lower limit value exceeded
9	error
Error-Codes (16 to 31, manufacturer-specific)	
16	Parameterization error After a validity check, the parameter data are (partially) rejected by the module. Check the context of parameters.
21	Hardware failure The module detected a hardware failure. Exchange the module.
22	Communication failure The module detected a communication problem at its ports, e. g. RS232/485/422, SSI or other interface. Check the connection or the function of the attached devices.
23	Direction error The direction is detected to be wrong. Check the parameterization or the control interface versus use case.
24	User software error The module detected an user application software error. Check the interoperability of the user application software revisions. Reinitialize user the application software of the module.
25	Cold-junction compensation error The module detected a defect or missing cold-junction compensation.
26	Sensor supply load dump The module detected a load dump at the sensor supply.
27	Unkown error

Table 9: Channel-specific diagnosis

Value (dec.)	Diagnostic message
28	Common error The module detected an error.
29	Configuration error The module detected an error in the configuration.

Meaning of the DPV1-error codes for the BL××-I/O-modules

The gateway translates the diagnostic messages sent from the BLxx-I/O-modules into DPV1-error codes.

The following table defines which module diagnostic is displayed as which DPV1-error code.

Table 10: Error codes / module diagnostics

DPV1- error code			Possible module diagnostics	
No. (dec.)	**Text**	**BL20/ BL67**	**I/O module**	**Diagnostic message of the module**
1	Short-circuit	BL20	BL20-2AIH-I	Short-circuit
			BL20-4DI-NAMUR	Short-circuit sensor
2	Undervoltage	BL20	BL20-PF-24VDC	Undervoltage field supply
			BL20-BR-24VDC	Undervoltage field supply
				Module bus undervoltage warning
			BL20-E-1SWIRE	Voltage U_{SW}, U_{SWERR}
			BL20-2RFID-x	Transceiver indicates power supply error
		BL67	BL67-PF-24VDC	Low voltage V_I/ Low voltage V_O
			BL67-2RFID-×	Transceiver indicates power supply error
3	Overvoltage			

Table 10: Error codes / module diagnostics

DPV1- error code			Possible module diagnostics	
No. (dec.)	**Text**	**BL20/ BL67**	**I/O module**	**Diagnostic message of the module**
4	Overload	BL20	BL20-PF-24VDC-D	Overload or short-circuit
			BL20-PF-120/230VAC-D	
			BL20-xDO-24VDC-0.5A-×	
			BL20-1CNT-24VDC	ERR_DO (Short-circuit/ open circuit at output DO1)
			BL20-E-1SWIRE	Overcurrent protective circuit-breaker, PKZ_{ERR}
			BL20-2RFID-×	Ident overcurrent (ransceiver power supply turned off)
			BL20-E-8AI-U/I-4PT/NI	Short-circuit (SC)
		BL67	BL67-2RFID-x	Ident overcurrent (ransceiver power supply turned off)
			BL67-4DI4DO-PD	Overcurrent Kx
			BL67-8XSG-PD	
4	Overload	BL67	BL67-1CNT/ENC	DIA_Dox
			BL67-1CVI	Overcurrent VC (at the valve power supply)
			BL67-2AI-PT	Short-circuit
5	Over temperature			
6	Wire-break	BL20	BL20-×AI-I(0/4..20MA)	Open circuit
			BL20-2AIH-I	
			BL20-E-8AI-U/I-4PT/NI	
			BL20-2AOH-I	
			BL20-4DI-NAMUR	
		BL67	BL67-×DI-PD	Open circuit
			BL67-2AI-I	
			BL67-2AI-PT	
			BL67-2AI-TC	
			BL67-4AI-V/I	
			BL67-4AI4AO-V/I	
			BL67-1SSI	

Table 10: Error codes / module diagnostics

DPV1- error code			Possible module diagnostics	
No. (dec.)	**Text**	**BL20/ BL67**	**I/O module**	**Diagnostic message of the module**
7	Upper limit value exceeded	BL20	BL20-1CNT-24VDC	– End of counter range wrong (counter mode) – Upper limit wrong (measurement mode)
			BL20-×AI-×	Measurement value range error (OoR)
			BL20-E-8AI-U/I-4PT/NI	
			BL20-2AIH-I	Overflow
			BL20-2AOH-I	Value above upper limit
		BL67	BL67-1CNT/ENC	STS_OFLW (overflow)
			BL67-1SSI	Sensor value overflow
			BL67-×AI-×/ BL67-×AO-×	Measurement value range error (OoR)
			BL67-2AI2AO-V/I	
8	Lower limit value exceeded	BL20	BL20-1CNT-24VDC	– Start of counter range wrong (counter mode) – Lower limit wrong (measurement mode)
			BL20-×AI-×	Measurement value range error (OoR)
			BL20-E-8AI-U/I-4PT/NI	
			BL20-2AIH-I	Underflow
			BL20-2AOH-I	Value below lower limit
		BL67	BL67-1CNT/ENC	STS_UFLW (underflow)
			BL67-1SSI	Sensor value underflow
			BL67-×AI-×/ BL67-×AO-×	Measurement value range error (OoR)
			BL67-2AI-2AO-VI	
9	Error	BL20	BL20-2AOH-I	Invalid value
			BL20-E-4AO-U/I	Over-/underflow OUFL
			BL20-E-8AI-U/I-4PT/NI	
		BL67	BL67-1CVI	DiagNode x/ DiagCVI: Emergencies transmitted since module start
			BL67-×AI×AO-×	Over-/underflow OUFL
			BL67-4AO-V	

Table 10: Error codes / module diagnostics

DPV1- error code			Possible module diagnostics	
No. (dec.)	**Text**	**BL20/ BL67**	**I/O module**	**Diagnostic message of the module**
16	Parameterization error	BL20	BL20-1CNT-24VDC	– invert-DI+latch-retr. not perm. (counter mode) – integration time wrong (measurement mode)
			BL20-E-1SWIRE	SPS SLAVE, RDYerr
			BL20-1RS×××	Parameterization error
			BL20-1SSI	
			BL20-2RFID-×	Parameter set inalid
		BL67	BL67-1RS×××	Parameterization error
			BL67-1SSI	
			BL67-1CNT/ENC	Parameterization error, ERR_PARA
			BL67-2RFID-×	Parameter set inalid
21	Hardware error	BL20	BL20-2RFID-×	Transceiver hardware error
			BL20-1RS×××	Hardware error
			BL20-E-8AI-U/I-4PT/NI	
			BL20-E-4AO-U/I	
			BL20-2AIH-I	
			BL20-2AOH-I	
		BL67	BL67-2RFID-×	Transceiver hardware error
			BL67-1RS×××	Hardware error
			BL67-×AI-×AO-V/I	

Table 10: Error codes / module diagnostics

DPV1- error code			Possible module diagnostics	
No. (dec.)	**Text**	**BL20/ BL67**	**I/O module**	**Diagnostic message of the module**
22	Communication error	BL20	BL20-1CNT-24VDC	Sensor pulse wrong (measurement mode)
			BL20-E-1SWIRE	– Communication SWIRE, COM_{ERR} – Communication SWIRE slave, SD_{ERR}
			BL20-1RS×××	Data flow control error
			BL20-2RFID-×	Parameter not supported by transceiver
			BL20-2AIH-I	HART® comm. error
			BL20-2AOH-I	
		BL67	BL67-1CVI	– Communication error transmitted since module start/ Guard Time – Communication error/ Guard Time timeout
			BL67-2RFID-×	Parameter not supported by transceiver
			BL67-1RS×××	Data flow control error
23	Direction error	BL20	BL20-1CNT-24VDC	Main count direction wrong (counter mode)
24	User software error	BL20	BL20-2AIH-I	Invalid parameter
			BL20-2AOH-I	
			BL20-2RFID-×	Software error
		BL67	BL67-2RFID-×	Software error
25	Cold-junction compensation error	BL67	BL67-2AI-TC	No Pt1000 sensor found
26	Sensor supply load dump	BL67	BL67-×DI-PD	Overcurrent/ short circuit sensor
			BL67-4DI4DO-PD	
			BL67-8XSG-PD	
27	Unknown error			
28	Common error	BL20	BL20-E-1SWIRE	General error , GEN_{ERR}
			BL20-1SSI	SSI group diagnostics
			BL20-2AIH-I	HART® status error
			BL20-2AOH-I	
		BL67	BL67-1SSI	SSI group diagnostics
29	Configuration error	BL20	BL20-E-1SWIRE	SWIRE master, SW_{ERR}

Description of user data for acyclic services

The following instances are defined for the BLxx-DPV1-gateways:

- Gateway Application Instance (Slot 0)
- Module Application Instance (Slot 1 to n)

Gateway Application Instance

Table 11: Gateway Application Instance

Index	Name	Data type	r /w	Remark
1	Gateway-ID	DWORD	r	Indent number of the gateway
2	Gateway-name	STRING	r	Name of the gateway
3	Gateway-revision	STRING	r	Firmware-revision of the gateway
4 to 23	reserved			
24	Gateway-diagnosis	WORD	r	Diagnosis data of the gateway
25 to 27	reserved			
28	Gateway-parameters	WORD	r/w	Parameter data of the gateway
29 to 31	reserved			
32	Module-input-list	Array of BYTE	r	List of all input channels in the station
33	Module-output-list	Array of BYTE	r	List of all output channels in the station
34	Modul-diag.-list	Array of BYTE	r	List of all module diagnosis messages
35	Module-parameter-list	Array of BYTE	r	List of all module parameters
36 to 244	reserved			
255	I&M-functions		r/w	Identification & Maintaining-services, I&M0 according to PROFIBUS-DP specification

Module Application Instance

Table 12: Module Application Instance

Index	Name	Data type	r/w	Remark
1	Modul-ID	DWORD	r	Indent number of the module
2	Modul-type	ENUM UINT8	r	Module type
3	Modul-revision	UINT8	r	Firmware-Revision of the module
4 to 18	reserved			
19	Input-data	specific	r	Input data of the respective module
20 to 22	reserved			
23	Output-data	specific	r/w	Output data of the respective module
24 to 30	reserved			
31	Module-parameters	specific	r/w	Parameters of the respective modules
32 to 255	Profile-specific	These indices are reserved for the data of several module profiles (e. g. RFID). The definitions of the profile indices can be found in the respective module descriptions.		

3 Connection to a Siemens PLC S7

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General

This chapter contains detailed information about the particularities when connecting a BLxx-DPV1-gateway to a Siemens PLC S7.

Note

For general information about the connection of the BL20- and BL67-gateway for PROFIBUS-DP to a Siemens PLC, please read the respective chapters/ paragraphs in the documentation for the DPV0-gateways (BL20: German D300822/ English D300458; BL67: German D300570/ English D300527).

Example configuration

The application examples described in the following are always based on the following configuration:

Used hardware:

- PLC S7, CPU-315F-2 DP from Siemens
- BL67-example station (see the following table) with BL67-GW-DPV1 for the connection to PROFIBUS-DPV1

Table 1: Example station

Module no.	Module name
	BL67-GW-DPV1
1	BL67-2AI-I
2	BL67-4DI-P
3	BL67-8DI-PD
4	BL67-1RS232
5	BL67-8XSG-PD
6	BL67-4DI-PD
7	BL67-2AI-I
8	BL67-2AI-TC

Used software:

- Simatic Manager V 5.2 from Siemens

Acyclic data transfer with system function bocks (SFBs) by Siemens

The need for acyclic data transfer exists wherever slave devices which provide several parameterization options have to be parameterized during operation.

In the Siemens PLC, the acyclic services are executed via the system function blocks SFB52 "RDREC" and SFB53 "WRREC".

The access to the process data of the gateway and the connected I/O-modules in a station is realized via the indices of the Gateway Application Instance and the Module Application Instance, see Chapter 2 Description of user data for acyclic services.

Acyclic reading with SFB52

Figure 1: SFB52 (RDREC)

```
CALL  "RDREC" , DB52
  REQ   :=TRUE
  ID    :=DW#16#0
  INDEX :=19
  MLEN  :=8
  VALID :="VALID"
  BUSY  :="Busy"
  ERROR :="Error"
  STATUS:="Status"
  LEN   :="Length"
  RECORD:=DB10.DBB0
```

Table 2: Input data SFB52

Parameter name	Meaning
REQ	REQ = 1, starts the data transmission
ID	Logical address of the respective BL××-I/O-module, taken from the hardware configuration. When establishing a connection to the gateway, the logical address is the "Diagnostic Address" assigned in the hardware configuration. Note: If the module to be addressed is an output module, bit 15 has to be set (e.g. for address 5: ID:=DW#16#8005). If the module concerned is a combination module, the lowest address has to be chosen.
INDEX	Number of the module's index to be read (see see Chapter 2, Description of user data for acyclic services).
MLEN	Maximum length of the data to be read.

Table 3: Output data SFB52

Parameter name	Meaning
VALID	New data set was received and valid.
BUSY	BUSY= 1: The read process is not yet terminated.
ERROR	ERROR = 1:Error occurred while reading.
STATUS	Error code of the function block (see Siemens-online help for SFB54 "RALRAM")
LEN	Length of the read data.
RECORD	Target area for the read data record. (here in this example DB10).

Example

Acyclic reading of input data at module no.6, BL67-4DI-PD of the example station:

The access to the module input data is done via module index no. 19 from the module application instance:

Table 4: Module Application Instance (exerpt)

Index (dec.)	Name	Data type	r/w	Remark
...				
19	Input data	specific	r	Input data of the respective module.
...				

Note

A detailed description of the Module Application Instance can be found in Chapter 2 Module Application Instance, page 2-29.

Figure 2: Station structure in the hardware configuration

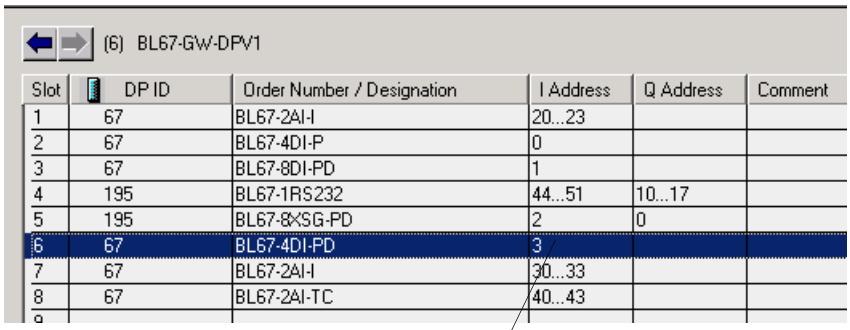


Figure 3: Access via SFB52

```
CALL  "RDREC" , DB52
 REQ    :=TRUE
 ID     :=DW#16#3
 INDEX  :=19
 MLEN   :=1
 VALID  :="VALID"
 BUSY   :="Busy"
 ERROR  :="Error"
 STATUS:="Status"
 LEN    :="Length"
 RECORD:=DB10.DBB0
```

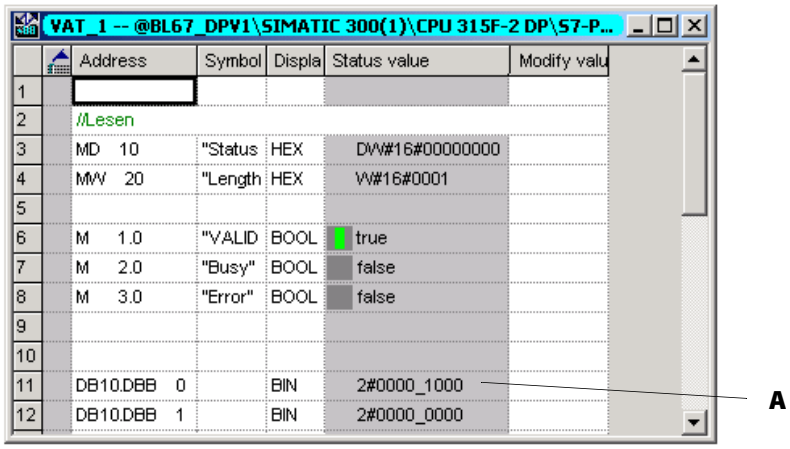
A logical address of channel 1 from module no.6

B Index no.

The module's input data are shown in DB10:

Figure 4: DB10 in VAT1

A channel 3 is active



Note

As the PLC always accesses the bus and the connected stations even during the acyclic data traffic, the transmitted values are permanently updated.

Acyclic writing with SFB53

Figure 5: SFB53 (WRREC)

```
CALL  "WRREC" , DB53
 REQ   :=TRUE
 ID    :=DW#16#1E
 INDEX :=31
 LEN   :=4
 DONE  :="VALID"
 BUSY  :="Busy"
 ERROR :="Error"
 STATUS:="Status"
 RECORD:=DB11.DBB0
```

Table 5: Input data SFB52

Parameter name	Meaning
REQ	REQ = 1, starts the data transmission
ID	Logical address of the respective BL××-I/O-module, taken from the hardware configuration. When establishing a connection to the gateway, the logical address is the "Diagnostic Address" assigned in the hardware configuration. Note: If the module to be addressed is an output module, bit 15 has to be set (e.g. for address 5: ID:=DW#16#8005). If the module concerned is a combination module, the lowest address has to be chosen.
INDEX	Number of the module's index to be written (see see Chapter 2, Description of user data for acyclic services).
MLEN	Maximum length of the data to be written.

Table 6: Output data SFB52

Parameter name	Meaning
VALID	New data set was written and valid.
BUSY	BUSY = 1: The write process is not yet terminated.
ERROR	ERROR = 1: Error occurred while writing.
STATUS	Error code of the function block (see Siemens-online help for SFB54 "RALRAM").
LEN	Length of the written data.
RECORD	Target area for the written data record. (here in this example DB11).

Example

Acyclic writing of parameters to module no. 7, BL67-2AI-I of the example station:

The access to the module input data is done via module index no. 31 from the module application instance:

Table 7: Module Application Instance (exerpt)

Index (dec.)	Name	Data type	r/w	Remark
...				
31	Module parameters	specific	r/w	Parameters of the respective module
...				

Note

A detailed description of the Module Application Instance can be found in Chapter 2 BL××-gateways for PROFIBUS-DPV1, page 2-29.

Figure 6: Station structure in the hardware configuration

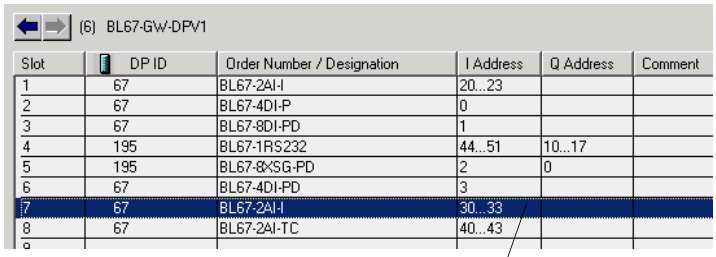


Figure 7: Access via SFB53

```
CALL  "WRREC" , DB53
 REQ   :=TRUE
 ID    :=DW#16#1E
 INDEX :=31
 LEN   :=4
 DONE  :="VALID"
 BUSY  :="Busy"
 ERROR :="Error"
 STATUS:="Status"
 RECORD:=DB11.DBB0
```

A logical address of channel 1 from module no. 7

B Index no.

Changing the parameters

Table 8: Parameters BL67-2AI-I

A default setting

Byte	Bit	Parameter	Value/Meaning
– Kanal 0			
0	0	Current mode	0 = 0...20 mA **A** 1 = 4...20 mA
	1	Value representation	0 = Integer (15 bit + sign) **A** 1 = 12 bit (left-justified)
	2	Diagnosis	0 = release **A** 1 = block
	3	Channel	0 = activate **A** 1 = deactivate
– Channel 1			
1	Assignment similar to byte n, channel 0		

The following parameters have to be changed:

- "Current mode" →"4 to 20 mA"
- "Value representation" →"12 bit left-justified".

To achieve this, bit 0 and bit 1 of byte 0 have to be set to "1" in DB11.

The module's parameter data are written to byte 1 via DB11:

Figure 8: DB11 in VAT1

A Channel 0, Bit 0 = 1 and Bit 1 = 1

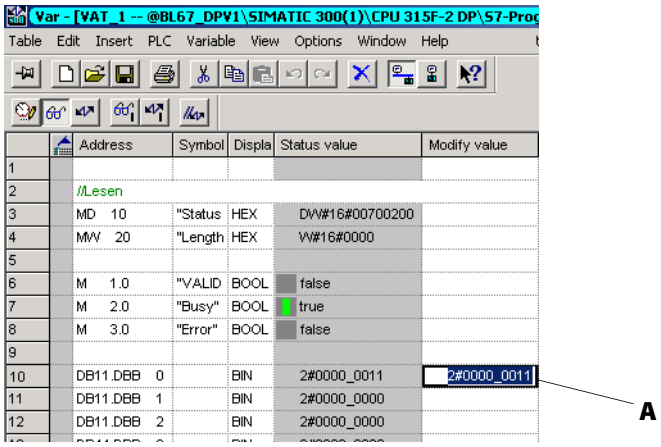
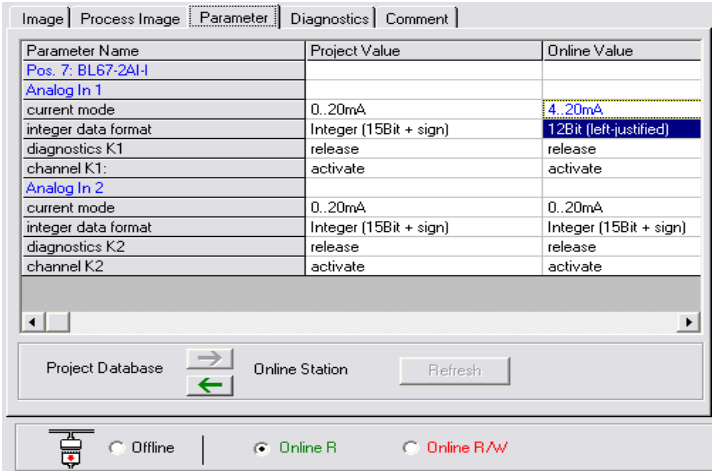

Var - [VAT_1 -- @BL67_DPV1\SIMATIC 300(1)\CPU 315F-2 DP\S7-Proc
Table Edit Insert PLC Variable View Options Window Help
Address Symbol Displa Status value Modify value
1
2 //Lesen
3 MD 10 "Status HEX DW#16#00700200
4 MW 20 "Length HEX W#16#0000
5
6 M 1.0 "VALID BOOL false
7 M 2.0 "Busy" BOOL true
8 M 3.0 "Error" BOOL false
9
10 DB11.DBB 0 BIN 2#0000_0011 2#0000_0011
11 DB11.DBB 1 BIN 2#0000_0000
12 DB11.DBB 2 BIN 2#0000_0000
A

Table 9: Parameter settings in the I/O-ASSISTANT



Example of DPV1-diagnosis

In addition to the device related diagnosis according to DPV0 and DPV1, the BLxx-gateways for PROFIBUS-DPV1 even show channel related diagnosis.

Furthermore a special help text, which clearly specifies the error, is defined for each diagnostic message.

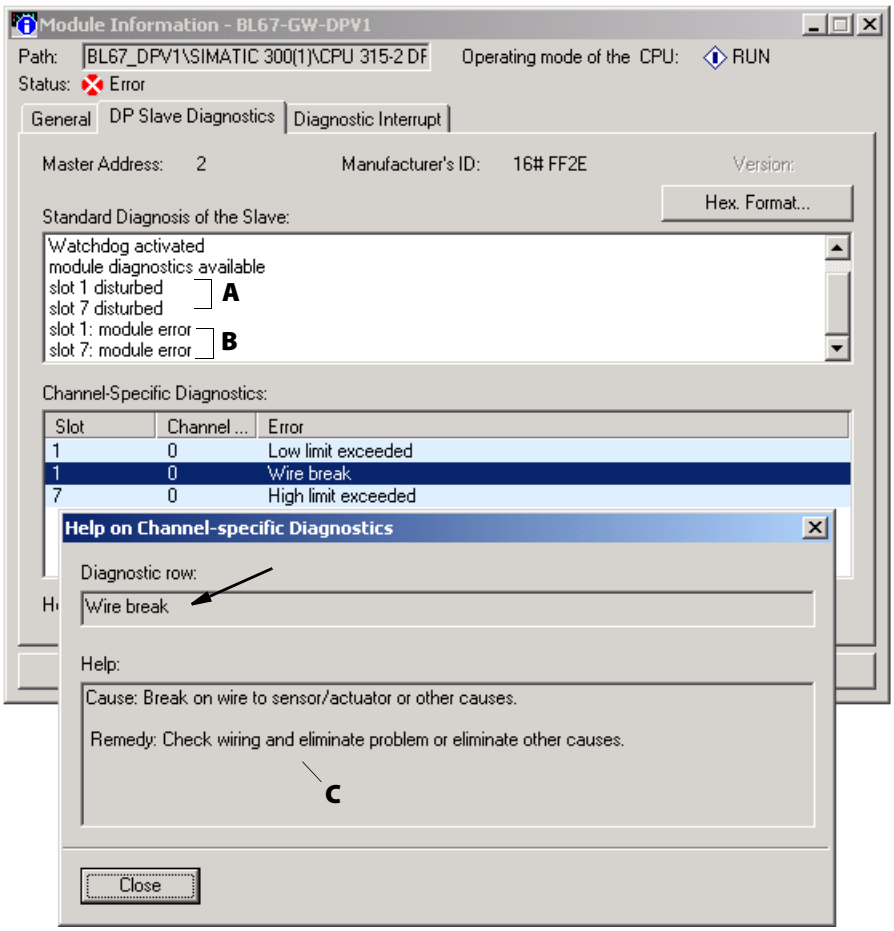


Figure 9: Diagnosis of the DPV1-gateways

A device related diagnosis acc. to DPV0
B device related diagnosis acc. to DPV1
C manufacturer specific help texts

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